

# 1 Summary

October 1, 2001 – December 31, 2002

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Grassland Bypass Project

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## Introduction

The Grassland Bypass Project (GBP) completed the first year of Phase II on December 31, 2002. This report documents results from the monitoring efforts from October 1, 2001 through December 31, 2002. One feature of the Phase II program was to adopt a calendar year reporting and compliance schedule. This report not only has the full calendar year of 2002 but also the three preceding months of October, November, and December 2001. Both Water Year (WY) 2002 and calendar year 2002 results will be discussed. Information from the initial five-year program are included where appropriate. One function of this report is to document results from the multi-agency data collection effort. The report builds upon previous information allowing for the discernment of changes in environmental conditions over time.

During the year, the Data Collection and Reporting Team (DCRT) continued to meet and review project data and associated reports. The following reports were reviewed and published during the year: monthly reports (15), quarterly data reports (5), and the WY 2001 annual report.

This annual report consists of technical chapters prepared by the agency staff responsible for their data collection effort within the GBP monitoring program and compiled by the San Francisco Estuary Institute (SFEI).

## Project Authorization

The U.S. Bureau of Reclamation (Reclamation) signed a Finding of No Significant Impact (FONSI) on November 3, 1995 for the execution of an agreement with the San Luis and Delta-Mendota Water Authority (Authority) to use a 28-mile segment of the San Luis Drain. This segment conveys agricultural drainage waters from the Grassland Drainage Area (GDA) to the San Joaquin River via a 6-mile segment of Mud Slough (North). A map of the GBP area and a schematic diagram are presented in Figures 1 and 2. Analysis from an environmental assessment dated April 1991, and supplemented in November 1995, resulted in the FONSI. A Use Agreement (UA) was also signed on November 3, 1995 between USBR and the Authority. The UA provided the terms and conditions for the use of the San Luis Drain until September 30, 2001.

A second phase of the project was authorized during an extensive review period covering most of 2000 and 2001. Documents for the continuation of the Grassland Bypass Project are listed in the Reference section of this chapter. All of the documents are available upon request.

The project continues the commitments made by participating agencies to address environmental benefits and risks. These commitments include the following:

- To ensure that progress continues toward long term resolution of agricultural subsurface drainage management activities,
- To ensure that there are no significant adverse effects to fish and wildlife, other environmental resources, and public health, and
- To ensure that the above listed commitments are implemented and addressed as part of the project.

Documented benefits include the following:

- Agricultural subsurface drainage water has been removed from the Grassland Water District (GWD) wetland supply channels allowing refuge managers to receive and apply all of their fresh water allocations according to optimum habitat management schedules.
- Removal of agricultural subsurface drainage water from the GWD wetland supply channels has reduced the selenium exposures to fish, wildlife, and humans in the wetland channels and Salt Slough.
- Combining agricultural subsurface drainage flows within a single concrete-lined structure allows for effective concentrated monitoring leading to detailed evaluation and effective understanding of drainage flows and associated selenium loads.
- The establishment of an accountable drainage entity has provided the framework necessary for responsible watershed management in the Grassland Basin.

Documented risks included the following:

- Combining agricultural drainage flows within the San Luis Drain has resulted in an increase in selenium and other constituents discharged into Mud Slough (North). These constituents are above the levels historically discharged to Mud Slough (North) and could have an adverse environmental effect on six miles of Mud Slough (North).
- Agricultural drainage flows entering wetland channels during floods.

## 2001-2002 Highlights

During WY 2002 and calendar year 2002, monthly selenium loads discharged from the terminus of the San Luis Drain were all below the load values agreed upon in the Phase II Use Agreement (Figure 3). The total selenium load discharged during the 2002 Water Year was 3,939 pounds, about 73 percent of the load limit specified in the 2001 Waste Discharge Requirement. The total selenium load discharged during the 2002 Calendar Year was 4,176 pounds, or 78 percent of the calendar year load limit. For comparison purposes, monthly selenium discharges are provided for water years 2001, 2000, 1999, 1998 and 1997 are presented in Table 1. The monthly selenium discharges for Calendar Years 1997 – 2002 are listed in Table 2. The monthly selenium discharge values specified in the new Use Agreement and Waste Discharge Requirement are listed in Tables 3 and 4. The Salinity Load Values and Goals specified in the new Use Agreement are listed in Tables 5a and 5b.

The US Geological Survey installed a new station in the San Joaquin River at Fremont Ford in November 2001. The new station, Site G, measures the flow, salinity, and temperature of water from the Grassland wetlands and other farmlands outside the Grassland Drainage Area. This site was required in the new Waste Discharge Requirement for Phase II of the Project.

The Grassland Area Farmers continued to collect water quality samples from the San Joaquin River at Hills Ferry to compliment quarterly biological monitoring there. The Regional

Water Quality Control Board stopped collecting weekly grab samples at this site in September 1999 due to uncertainty about the source of water.

The revised Monitoring Plan for Phase II of the Project was completed June 2002. The revised Quality Assurance Project Plan was completed in August 2002.

### **Additional Reports and Studies**

**Sources of Selenium Studies.** Heavy rainfall during the 1997 and 1998 Water Years resulted in selenium load discharges that exceeded the load values specified in the Waste Discharge Requirement and First Use Agreement. On-farm management activities were not able to control excessive rainfall and associated storm runoff within the Grassland Drainage Area. As a consequence, discharges through the San Luis Drain, and in some cases, wetland water supply channels, were above what were planned. The Oversight Committee recommended that additional studies be undertaken to establish the sources of selenium. The USGS is preparing a “Transient Three-Dimensional Groundwater Flow Model for the Grasslands and Adjacent Area”; the first draft is due December 2003. The Lawrence Berkeley National Laboratory published a “District Level Water Balance and Selenium Load Model for the Grasslands Area” in December 2003.

**Delta-Mendota Canal Water Quality Study.** In July 2002, Reclamation began a study of selenium, salinity, and boron in water in the Delta-Mendota Canal and Mendota Pool. These facilities convey source water to the farms and wetlands in the Grasslands Basin. Daily composite samples have been collected from four sites to study the temporal and local changes in water quality due to the operation of the canal, drainage sumps, and tail water inlet structures. Reclamation has published monthly reports and will be preparing criteria for operating the canal and related facilities to improve water quality.

## **Monitoring Program**

The GBP monitoring plan outlines the processes for collecting data to determine if the terms and conditions of the GBP are being met. Flow, water quality, sediment, biota, and chronic toxicity data are collected to assess project impacts (Table 6). The data gathered from this effort allow evaluation of the degree to which the commitments of the Use Agreement and Waste Discharge Requirement are being met.

### **Water Quality Monitoring in the San Joaquin River at Hills Ferry**

As reported in the 2000 – 2001 Annual Report, the Authority has been collecting weekly grab samples from this site since September 2000 to support biological monitoring there and to aid potential future development of revised water quality criteria. The results of water quality analysis at this site for the fifteen month study period are listed in Table 7a; the annual averages since 1997 are listed in Tables 7b and 7c.

### **Salinity Load Values and Discharge Goals**

Appendix E of the Phase II Use Agreement specifies monthly Salinity Load Values (Table 5a) that are intended to guide reductions in salt discharges until such time as the Regional

Board adopts its own numeric limits on salt discharges to achieve compliance with water quality objectives for the San Joaquin River.

To determine if Salt Load Values are being met, the Attributable Discharge of salts will be compared to the Salt Load Value for the time period under consideration. Salt load will be measured at the inlet to the Drain (referred to as “Site A”), except that salt load discharged to the Grassland Water District from the Drainage Area during storm events will be measured at the discharge points into the Grassland Water District, and load to be exempted under Appendices F and G of the Phase II Use Agreement.

If the Attributable Discharge of Salinity exceeds the applicable Salinity Load Value in any given month or year during the term of this Agreement, a Drainage Incentive Fee shall be calculated in accordance with the Performance Incentive System as stated in section IV.B. of this Agreement.

The Salinity Discharge Goals are described in Appendix E of the Phase II Use Agreement and are listed in Table 5b. The Salinity Discharge Goals are lower than the Salinity Load Values because they match percentage reductions in Selenium Load Values and have not been adjusted to reflect the imperfect correlation between discharges of salts and of selenium. The Salinity Discharge Goals are intended to provide a measurement of progress toward reducing salinity discharges commensurate with selenium discharges, but carry no legally enforceable consequences.

## **Project Organization**

The GBP involves the coordination and cooperation of several State and Federal agencies whose authority, interests, or activities directly overlap in one or more aspects of the GBP. These agencies include USBR, USFWS, USGS, USEPA, CVRWQCB, CDFG and the SL&D-MWA. The latter organization includes local drainage and water districts that participate in the drainage activities. The Grassland Area Farmers (GAF) formed a regional drainage entity under the umbrella of the San Luis and Delta-Mendota Water Authority.

### **Oversight Committee (OC)**

The Oversight Committee is comprised of senior level representatives from USBR, USFWS, CDFG, CVRWQCB, and USEPA. The role of the OC is to review process and assure performance of all operations of the GBP as specified in the Phase II Use Agreement, including monitoring data, compliance with selenium load reduction goals, and other relevant information.

The OC meets in a public forum, as needed, to review the status, progress, and monitoring results of the GBP. The OC considers findings and recommendations from the GBP subcommittees. The OC also considers input and recommendations from the San Luis and Delta-Mendota Water Authority and other key stakeholders.

### **Technical and Policy Review Team (TPRT)**

The Grassland Bypass Project Oversight Committee formed the TPRT to serve as staff to the OC. The TPRT consists of a representative from CVRWQCB, CDFG, USBR, USFWS, and USEPA, plus a member from USGS serving as an independent technical advisor. The TPRT is

responsible for obtaining and providing the necessary information, developing alternatives, and formulating recommendations to the OC. This includes producing, or overseeing the production of any analytical and interpretive reports, other than the normal monthly, quarterly, and annual reports, and obtaining appropriate peer or scientific review as necessary. The TPRT is responsible for coordinating, evaluating, and recommending associated research and investigation needs as the GBP proceeds. The TPRT works closely with the DCRT, described below, and, with approval of the OC, may designate and utilize additional subcommittees or task groups as needed to accomplish specific tasks or responsibilities.

### **Data Collection and Reporting Team (DCRT)**

The Data Collection and Reporting Team consists of the agency representatives and contractors responsible for data collection and reporting. The DCRT is responsible for coordinating monitoring activities, identifying and resolving any issues involving data collection and reporting, and making recommendations for revision of data collection and reporting procedures to the TPRT. The DCRT prepared the monitoring plan and the associated Quality Assurance Project Plan (QAPP). The DCRT met five times (quarterly) during the first year of Phase II.

### **Data Management**

Each agency collecting data is responsible for its own internal data quality and data management procedures. These are detailed in the Quality Assurance Project Plan. Each agency submits its data to the San Francisco Estuary Institute for compilation of data and information from all sampling sites in a timely manner.

### **Reporting**

The San Francisco Estuary Institute publishes monthly, quarterly and annual reports. Monthly and quarterly data reports consist of primary data from the 14 key monitoring stations as depicted in Table 6: San Luis Drain (Sites A, B), Mud Slough (Sites C, D, I2, and E), Salt Slough (Site F), wetland channels (Sites J, K, L2, and M2), and the San Joaquin River (Sites G, H, N). The monthly report presents daily and weekly data collected during that particular month, including the calculated selenium load discharged at Site B, the terminus of the San Luis Drain. Quarterly data reports consist of all available data from all stations during a 3-month period. All reports are distributed to the participating parties and are available upon request.

Most of the GBP data reports are available at the Institute's Website:

<http://www.sfei.org/grassland/reports/gbppdfs.htm>

Annual reports are available upon request from the Bureau of Reclamation, South-Central California Area Office, telephone (559) 487-5133.

## References

### Data Reports:

- San Francisco Estuary Institute. 1997 – 2002. Grassland Bypass Project Monthly Report, October 1996 through December 2002 (75 reports). Oakland, CA.  
<http://www.sfei.org/grassland/reports/gbpdfs.htm>
- San Francisco Estuary Institute. 1997 – 2002. Grassland Bypass Project Quarterly Data Report. October 1996 through December 2002 (21 reports). Oakland, CA.  
<http://www.sfei.org/grassland/reports/gbpdfs.htm>
- San Francisco Estuary Institute. 1997 – 2001. Grassland Bypass Project Quarterly Narrative and Graphical Summary. October 1996 through September 2001 (16 reports). Oakland, CA.  
<http://www.sfei.org/grassland/reports/gbpdfs.htm>

### Annual Reports:

- San Francisco Estuary Institute. May 2003. Grassland Bypass Project Annual Report 2000-2001. Oakland, CA.
- San Francisco Estuary Institute. May 2002. Grassland Bypass Project Annual Report 1999-2000. Oakland, CA.
- San Francisco Estuary Institute. May 2001. Grassland Bypass Project Annual Report 1998-1999. Oakland, CA.
- San Francisco Estuary Institute. June 1999. Grassland Bypass Project Annual Report October 1, 1997 through September 30, 1998.. Oakland, CA.
- U.S Bureau of Reclamation, et. al., May 12, 1998. Grassland Bypass Project Annual Report. October 1, 1996 – September 30, 1997. Prepared for the Grassland Bypass Project Oversight Committee. Sacramento, California.

### Phase I Documents

- U.S. Bureau of Reclamation. Finding of No Significant Impact and Supplemental Environmental Assessment. Grassland Bypass Channel Project. Interim Use of a Portion of the San Luis Drain for Conveyance of Drainage Water Through Grassland Water District and Adjacent Grassland Areas. November 1995. U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, CA.
- U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. Agreement for Use of the San Luis Drain. Agreement No. 6-07-20-W1319. November 1995. U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, CA.
- U.S. Bureau of Reclamation et al. Compliance Monitoring Program for Use and Operation of the Grassland Bypass Project. September 1996. U.S. Bureau of Reclamation, Mid-Pacific Region, Sacramento, CA.

### Phase II Documents

- U.S. Bureau of Reclamation, Mid-Pacific Region. February 2001. Biological Assessment for the Grassland Bypass Project. Sacramento, CA.
- URS. May 25, 2001. Grassland Bypass Project Environmental Impact Statement and Environmental Impact Report. Oakland, CA.
- U. S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. September 27, 2001. Final Biological Opinion for the Grassland Bypass Project. File Number 1-41-01-F-0153. Sacramento, CA.

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U.S. Bureau of Reclamation, Mid-Pacific Region. September 28, 2001. Record of Decision for the Grassland Bypass Project EIS/EIR. Sacramento, CA.

<http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/RODdraftfinal.pdf>

California Regional Water Quality Control Board, Central Valley Region. September 7, 2001. Waste Discharge Requirements Order No. 5-01-234. Sacramento, CA.

[http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/Gbp\\_wdr2.pdf](http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/Gbp_wdr2.pdf)

U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. September 28, 2001. Agreement for Use of the San Luis Drain for the Period October 1, 2001 through December 31, 2009. Agreement No. 01-WC-20-2075.

<http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/Agree01-WC-20-2075.pdf>

U.S. Bureau of Reclamation, et. al. June 2002. Monitoring Program for the Operation of the Grassland Bypass Project. Prepared by the Grassland Bypass Project Data Collection and Review Team.

[http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/Phase2\\_monitoring\\_plan.pdf](http://www.usbr.gov/mp/mp150/grassland/RelatedDocuments/Phase2_monitoring_plan.pdf)

U.S. Bureau of Reclamation, et. al. August 22, 2002. Quality Assurance Project Plan for the Compliance Monitoring Program for Use and Operation of the Grassland Bypass Project.



**Table 1. Monthly Selenium Discharges from the San Luis Drain (Station B) into Mud Slough Compared to Load Values, Pounds, Water Years 1997 - 2002**

Table 1. Monthly Selenium Discharges from the San Luis Drain (Station B) into Mud Slough Compared to Load Values, Pounds, Water Years 1997 - 2002

Water Year	1997			1998			1999			2000			2001			2002			2003
	Load Value	Discharge	Actual	Load Value	Discharge	Actual	Load Value	Discharge	Actual	Load Value	Discharge	Actual	Load Value	Discharge	Actual	Load Value	Discharge	Actual	Load Value
October	348	202		348	248		348	277		348	181		348	146		315	118		308
November	348	252		348	207		348	226		348	193		348	174		315	148		308
December	389	285		389	178		389	239		389	236		389	194		353	170		334
January	533	599		533	335		506	284		479	285		453	255		385	246		359
February	866	878		866	965		823	609		779	541		736	574		619	483		571
March	1066	1,119		1,066	1,600		1,013	799		959	761		906	779		753	586		685
April	799	1,280		799	1,554		759	529		719	549		679	481		577	500		538
May	666	849		666	1,371		633	482		599	427		566	408		488	363		464
June	599	611		599	807		569	524		539	439		509	426		429	397		397
July	599	428		599	615		569	462		539	425		509	416		429	365		397
August	533	348		533	500		506	418		480	324		453	353		387	322		363
September	350	109		350	388		350	275		350	242		350	171		310	241		303
Total Discharge from San Luis Drain		6,960	(1)		8,768	(2)		5,124			4,603			4,377			3,939		
Total Load Limitation	6,660			6,660			6,327			5,994			5,661			5,360			5,027
Discharge as Percent of Total		105%			132%			81%			77%			77%			73%		

Data Source: San Francisco Estuary Institute. <http://www.sfei.org/grassland/reports/>

Notes: (1) Includes 137 lbs of selenium released into Grassland wetland supply channels after January 1997 storms

(2) Includes 350 lbs of selenium released into Grassland wetland supply channels after February 1998 storms due to unforeseen and uncontrollable circumstances

**Table 2. Monthly Selenium Discharges from the San Luis Drain (Station B) into Mud Slough Compared to Load Values, Pounds, October 1996 - December 2002**

Calendar Year	1996		1997		1998		1999		2000		2001		2002	
	Load Value	Actual Discharge	Load Value	Actual Discharge	Load Value	Actual Discharge	Load Value	Actual Discharge	Load Value	Actual Discharge	Load Value	Actual Discharge	Load Value	Actual Discharge
January			533	599	533	335	506	284	479	285	453	255	385	246
February			866	878	866	965	823	609	779	541	736	574	619	483
March			1,066	1,119	1,066	1,600	1,013	799	959	761	906	779	753	566
April			799	1,280	799	1,554	759	529	719	549	679	481	577	500
May			666	849	666	1,371	633	482	599	427	566	408	488	363
June			599	611	599	807	569	524	539	439	509	426	429	397
July			599	428	599	615	569	462	539	425	509	416	429	365
August			533	348	533	500	506	418	480	324	453	353	387	322
September			350	109	350	388	350	275	350	242	350	171	310	241
October	348	202	348	248	348	277	348	181	348	146	315	118	308	216
November	348	252	348	207	348	226	348	193	348	174	315	148	308	216
December	389	285	389	178	389	239	389	236	389	194	353	170	334	241
Total Discharge from San Luis Drain		739	(1)	6,854	(2)	8,877	4,992	4,507	6,528	69%	6,144	4,299	5,327	4,176
Total Load Limitation	1,085						6,813	73%						
Discharge as Percent of Total		68%		97%		125%						70%		78%

Data Source: San Francisco Estuary Institute. <http://www.sfei.org/grassland/reports/>

Notes: (1) Includes 137 lbs of selenium released into Grassland wetland supply channels after January 1997 storms

(2) Includes 350 lbs of selenium released into Grassland wetland supply channels after February 1998 storms due to unforeseen and uncontrollable circumstances

**Table 3. Wet Year Selenium Load Values for the San Luis Drain (Station B), pounds, October 2001 - December 2009**

	2001	2002	2003	2004	2005	2006	2007	2008	2009
January		385	359	333	289	211	211	211	211
February		619	571	523	440	297	297	297	297
March		753	685	618	496	297	297	297	297
April		577	538	499	433	315	315	315	315
May		488	464	439	400	322	322	322	322
June		429	397	365	308	212	212	212	212
July		429	397	365	310	214	214	214	214
August		387	363	339	299	225	225	225	225
September		310	303	297	291	264	264	264	264
October	315	308	301	294	260	260	260	260	260
November	315	308	301	294	260	260	260	260	260
December	353	334	316	298	211	211	211	211	211
Annual load value	983	5,328	4,665	4,662	3,996	3,088	3,088	3,088	3,088

Data Source: U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. September 28, 2001. Agreement for Use of the San Luis Drain for the Period October 1, 2001 through December 31, 2009. Agreement No. 01-WC-20-2075. Appendix C.

**Table 4. Dry Year Selenium Load Values for the San Luis Drain (Station B), pounds, October 2001 - December 2009**

	2001	2002	2003	2004	2005	2006	2007	2008	2009
January		385	359	333	289	211	211	198	185
February		619	571	523	440	297	297	265	234
March		753	685	618	496	297	297	265	233
April		577	538	499	433	315	315	282	249
May		488	464	439	400	322	322	288	255
June		429	397	365	308	212	212	188	165
July		429	397	365	310	214	214	188	166
August		387	363	339	299	225	225	190	175
September		310	303	297	291	264	264	200	193
October	315	308	301	294	260	260	260	229	190
November	315	308	301	294	260	260	260	225	190
December	353	334	316	298	211	211	211	198	185
Annual load value	983	5,328	4,995	4,662	3,996	3,088	3,088	2,754	2,421

Data Source: U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. September 28, 2001. Agreement for Use of the San Luis Drain for the Period October 1, 2001 through December 31, 2009. Agreement No. 01-WC-20-2075. Appendix C.

**Table 5a. Salinity Load Values for the San Luis Drain (Station B), tons October 2001 - December 2005**

	2001	2002	2003	2004	2005
January		11,935	11,338	10,741	10,526
February		20,924	19,877	18,831	18,455
March		24,208	22,998	21,788	21,352
April		20,015	19,014	18,014	17,653
May		20,021	19,020	18,019	17,659
June		20,624	19,593	18,562	18,191
July		21,862	20,769	19,676	19,283
August		18,396	17,476	16,556	16,225
September		10,210	9,700	9,189	9,006
October	6,423	6,423	6,102	5,781	5,665
November	7,036	7,036	6,684	6,332	6,205
December	8,646	8,646	8,214	7,782	7,626
Annual load value	22,105	190,301	180,786	171,271	167,845

Data Source: U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. September 28, 2001. Agreement for Use of the San Luis Drain for the Period October 1, 2001 through December 31, 2009. Agreement No. 01-WC-20-2075. Appendix E.

Note: Salinity Load Values for 2006 - 2009 will be calculated based on Water Year hydrological conditions; the details are discussed in Appendix I of the 2001 Use Agreement.

**Table 5b. Salinity Discharge Goals for the San Luis Drain (Station B), tons October 2001- December 2005**

	2001	2002	2003	2004	2005
January		9,548	8,951	8,354	8,139
February		16,739	15,693	14,647	14,270
March		19,367	18,156	16,946	16,510
April		16,012	15,011	14,011	13,650
May		16,017	15,016	14,015	13,655
June		16,500	15,468	14,437	14,066
July		17,490	16,397	15,304	14,910
August		14,716	13,797	12,877	12,546
September		8,168	7,658	7,147	6,963
October	5,138	5,138	4,817	4,496	4,381
November	5,629	5,629	5,277	4,925	4,798
December	6,917	6,917	6,485	6,052	5,897
Annual load value	17,684	152,241	142,726	133,211	129,785

Data Source: U.S. Bureau of Reclamation and the San Luis & Delta-Mendota Water Authority. September 28, 2001. Agreement for Use of the San Luis Drain for the Period October 1, 2001 through December 31, 2009. Agreement No. 01-WC-20-2075. Appendix E.

Note: Salinity Discharge Goals for 2006 - 2009 will be calculated based on Water Year hydrological conditions; the details are discussed in Appendix I of the 2001 Use Agreement.

Table 6. Grassland Bypass Project Monitoring Stations, Parameters, and Sampling Frequencies

Station / Site / Location	Flow	Temperature	pH	Electrical Conductivity	Total Suspended Solids	Selenium	Boron	Nutrients	Molybdenum	Sediment		Biota	Chronic and Acute Toxicity
										Quality	Quantity		
San Luis Drain	C	C	W	C	W	W	W	W / M (1)	W / M (1)	A	A		M / Q
B checks 1-2	C	C / W	W	C / W	W	D	D / W	W / M (1)	W / M (1)	A	A		M / Q
checks 10-11										A	A		
checks 14-15										A	A		
checks 17-18										A	A		
Mud Slough		W	W	W		W	W	W / M (1)	W / M (1)	Q	A	Q	M / Q
D	C	C	W	C		W	W	W / M (1)	W / M (1)	Q		Q	M / Q
E										Q		Q	
I2		W	W	W		W	W			Q		Q	M / Q
F	C	C	W	C		W	W			Q		Q	
Salt Slough													
Wetland Channels	D	W	W	W		W	W						
K	D	W	W	W		W	W						
L2	D	W	W	W		W	W						
M2	D	W	W	W		W	W						
San Joaquin River	C	C / W	W	C / W	W	W	W	W / M (1)	W / M (1)			Q	
G		W	W	W		W	W					Q	
H		W	W	W		W	W					Q	
N	C	C / W	W	C / W	W	D	W	W / M (1)	W / M (1)				

Data Source: U.S. Bureau of Reclamation, et. al. June 2002. Monitoring Program for the Operation of the Grassland Bypass Project.

Notes:

Sampling Frequency C = Continuous Q = Quarterly

D = Daily A = Annually

W = Weekly M = Monthly

Letters in Bold indicate a monitoring requirement within Waste Discharge Requirement 5-01-234.

(1) Weekly sampling: March through August, and Monthly sampling: September through February

**Table 7a. San Joaquin River at Hills Ferry (Site H) Average Water Quality October 2001 - December 2002**

Sample Date	Specific Conductance $\mu\text{mhos/cm}$	Selenium $\mu\text{g/L}$	Boron $\text{mg/L}$
Oct-2001	1,680	3.0	0.8
Nov-2001	1,610	2.5	1.0
Dec-2001	2,153	2.9	1.4
Jan-2002	1,816	3.3	1.2
Feb-2002	2,243	7.1	1.6
Mar-2002	2,360	7.0	1.8
Apr-2002	2,500	9.6	1.8
May-2002	2,223	7.5	1.5
Jun-2002	2,223	10.0	1.8
Jul-2002	1,758	7.0	2.1
Aug-2002	1,863	7.2	1.8
Sep-2002	1,780	6.1	1.3
Oct-2002	1,698	5.1	1.1
Nov-2002	1,618	3.5	1.1
Dec-2002	1,608	3.1	1.2
Maximum	2,840	13.2	3.8
Minimum	950	1.2	0.6
Average	1,931	5.7	1.4
Number of samples	61	61	61

Data Source: Samples collected by Grassland Area Farmers; analyses by South Dakota State University Olsen Laboratory.

**Table 7b. San Joaquin River at Hills Ferry (Site H) Average Water Quality during Water Years 1997 – 2002**

Water Year	Specific Conductance $\mu\text{mhos/cm}$	Selenium $\mu\text{g/L}$	Boron $\text{mg/L}$
WY 1997	1,543	6.8	1.3
WY 1998	1,021	3.1	0.8
WY 1999	1,531	5.0	1.3
WY 2000			
WY 2001	1,838	6.4	1.5
WY 2002	2,002	6.1	1.5

Data Sources: 1997 - 1999 averages calculated from weekly grab samples collected by the CVRWQCB at Station STC 521  
 No samples collected between October 1, 1999 to September 30, 2000  
 2001 - 2002 averages calculated from weekly grab samples collected by the Grassland Area Farmers (Site H)

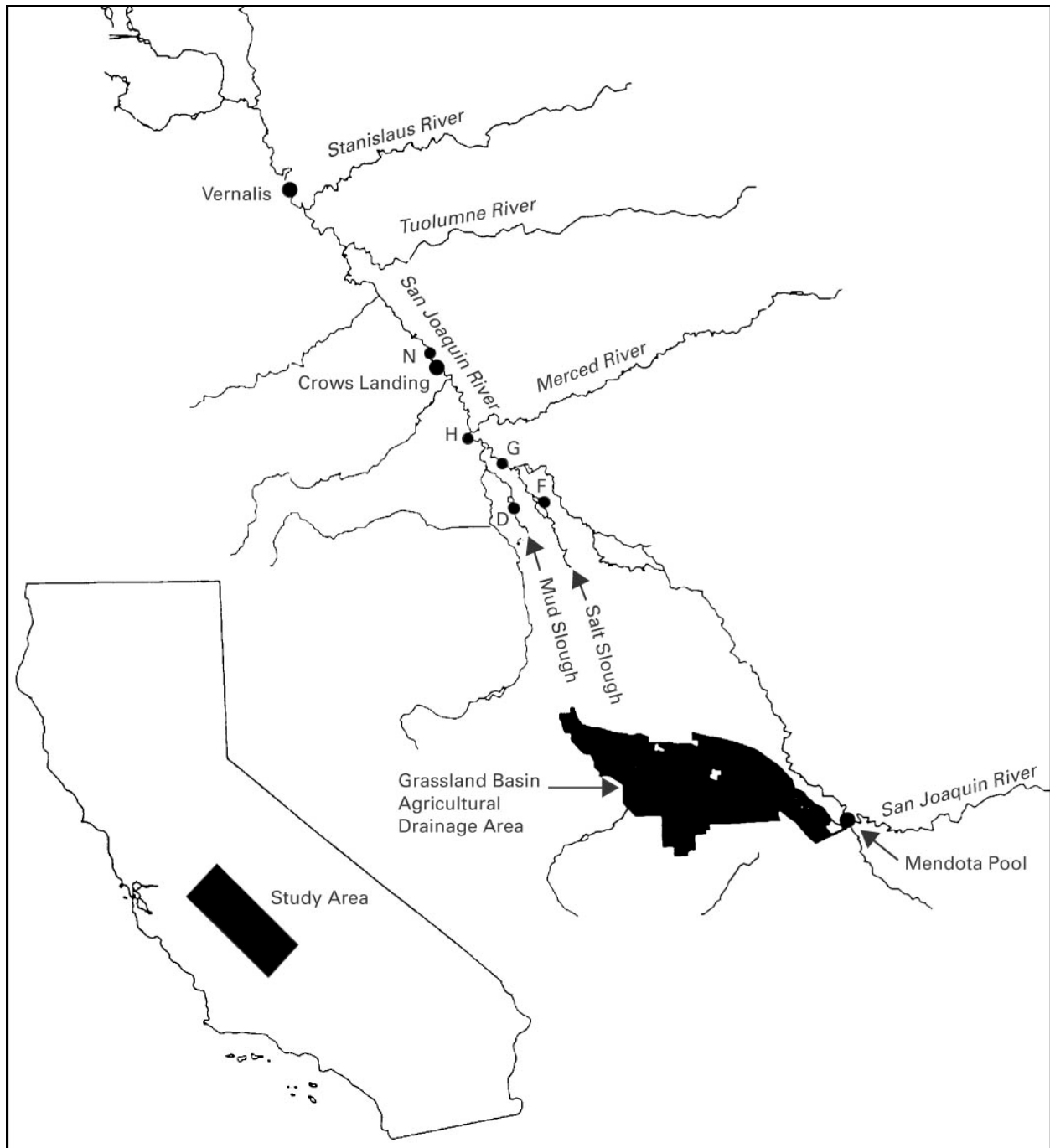
Note: Water Year = October 1 - September 30

**Table 7c. San Joaquin River at Hills Ferry (Site H) Average Water Quality during Calendar Years 1997 – 2002**

	Specific Conductance $\mu\text{mhos/cm}$	Selenium $\mu\text{g/L}$	Boron $\text{mg/L}$
1997	1,695	7.0	1.4
1998	855	2.7	0.7
1999	1,725	6.0	1.4
2000	1,525	4.3	1.2
2001	1,924	6.1	1.5
2002	1,965	6.4	1.5

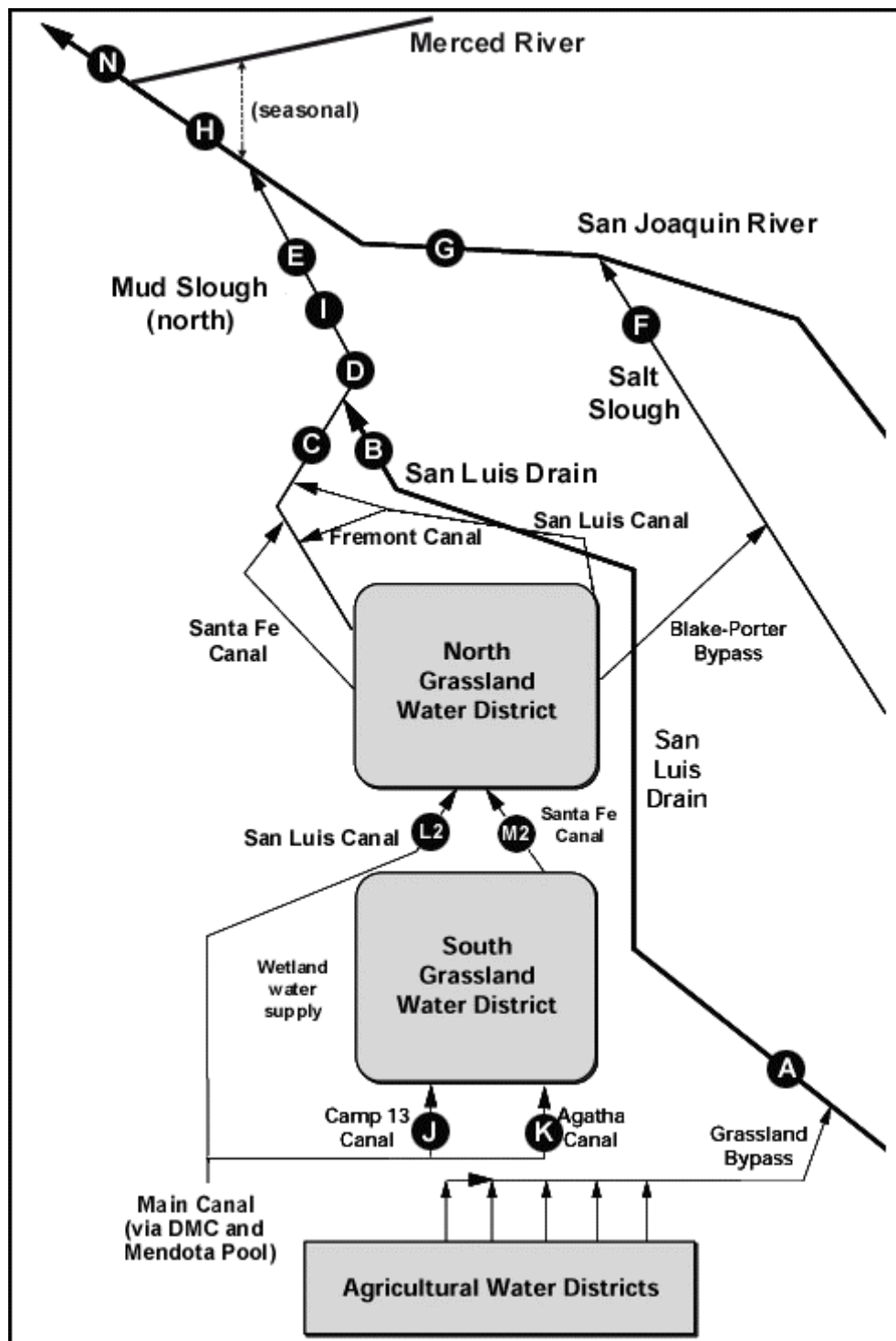
Data Sources: 1997 - 1999 averages calculated from weekly grab samples collected by the CVRWQCB at Station STC 521  
 2000 - 2002 averages calculated from weekly grab samples collected by the Grassland Area Farmers (Site H)

**Figure 1. Map of the Grassland Bypass Project**





**Figure 2. Schematic Diagram Showing Locations of GBP Monitoring Sites Relative to Major Hydrologic Features of the Study Area**



**Figure 3. Grassland Bypass Project October 2001 - December 2002 Monthly Selenium Discharges into Mud Slough (Station B) Compared to Load Values**

